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ABSTRACT

The purpose of the case study was to understand the effects of computer-based PLATO (Programmed Logic for Automatic Teaching Operations) mathematics curriculum on the classroom environment and the children in it. A cultural perspective was taken and anthropological techniques were used to investigate children's learning of mathematics in the context of a PLATO classroom. The data were obtained through observations and interviews over two years of one teacher and selected children, plus a teacher log and discussions with the curriculum developers. Results show that the children and the teacher benefited from the PLATO mathematics curriculum in achievement, typing, reading, and enthusiasm in mathematics. (MN)

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PLATO And Fourth Grade Mathematics

Bernadine Evans Stake

This paper is based on the case study, "PLATO and Fourth Grade Mathematics," which has been accepted in its entirety (205 pages) for publication in The Journal of Children's Mathematical Behavior, Vol. 2, No. 2.

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A GLIMPSE OF SARA AT A PLATO TERMINAL

"I don't know my sixes, and I don't want to do them."

October 28, 1975 (Afternoon)

One of PLATO's* problems was with its "extended core storage." Everybody called it "ECS." Terminals were generally used in the afternoon more than in the morning. When all the computer's core storage was in use new arrivals might not be able to access the lesson they needed. Before PLATO could make a lesson available to a student, the lesson had to be moved from the computer's disc memory (which represented a kind of vast storehouse of computer-programmed lessons), into the extended core storage, a smaller but more accessible portion of computer memory. But if ECS was filled with lessons for students who were already signed on, a newly-arriving student might not be able to get the specific lesson that he or she needed. In such a case the student just had to keep trying until some ECS opened up for them. (This was very much like getting a busy signal on the telephone, and having to re-dial a moment or two later on.)

Sara and three other children were having exactly this problem. Sara tried various keys. She pushed the CLEAR button and tried the touch panel. All to no avail. She asked Ms. Hamilton for help and was told to try different approaches, such as turning the terminal off, waiting a few minutes and then turning it on again. (This was in fact the correct remedy for a different problem; in the present

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*PLATO - Programmed Logic for Automatic Teaching Operations

case it could not have been helped.) Sara tried every approach a couple of times, methodically.

Sara was relaxed and calm to begin with, but became a bit frustrated when PLATO did not respond to her attempts to access a lesson. She hit the keys harder and said, "PLATO, you're wasting my time."

After several minutes of waiting, then checking, she went to her desk and brought a Language workbook back to the terminal. She worked in the textbook as she sat waiting for PLATO to become less busy. She was learning the limitations of technology.

There were four terminals in the classroom. Children took turns working on Math lessons that the developers and the teacher had prescribed for them. Each child worked at his/her own level and pace. The terminal was down for the day so Sara did not have her "turn" for the day.

October 29, 1975 (Morning)

Since Sara had missed her PLATO turn the day before she was one of the first to be "on" the next morning. Ms. Hamilton was diligent in her effort to see that PLATO time was shared in an equitable manner.

Sara smiled as she worked. She did an ADDITION CHECK-UP (Whole Numbers, B12).[*] *She had no trouble following directions or working*

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*The description of lessons in the three Math Strands are in the publications Description of Graphing Strand Lessons by Donald Cohen and Gerald Glynn, Computer-Based Education Research Laboratory, University of Illinois, Urbana, Illinois, June, 1974; Description of PLATO Whole Number Arithmetic Lessons by Bonnie Anderson Seiler and Charles S. Weaver, Computer-Based Education Research Laboratory, University of Illinois, Urbana, Illinois, June, 1976; The Fractions Curriculum--PLATO Elementary School Mathematics Project by David Kibby and Sharon Dugdale, Computer-Based Education Research Laboratory, University of Illinois, Urbana, Illinois, March, 1975.

the problems. Sara typed slowly. She read the directions slowly and carefully as she worked. Her second lesson was RUBBER STAMP (Whole Numbers, D1). Again she advanced through the lesson with no trouble.

Her third lesson was PARKING LOT (Whole Numbers, D2G). Sara finished the "fives" easily, PLATO informed her that she was ready for the "sixes." Sara turned to me and said, "I don't know the sixes and I don't want to do them." I knew that most children her age were working on the sixes so I asked her if she didn't want to try them. She said she did not want to.

Not listening, PLATO presented her next problem: 5 X 6. Sara worked it even though she had said she wasn't going to. Her answer was correct. She clapped her hands and seemed happy with herself.

The authors of the lessons had structured them in such a way that most children continued to be successful, but at the same time, challenged rather than bored. In this instance Sara was afraid to try to multiply by 6. PLATO presented 5 X 6 and since Sara knew the 5's she worked the problem; was successful, happy and confident at least for the moment. The lessons were structured so that sequencing provided logical direction for the child. At the same time that Sara was saying that she wouldn't do the 6's, PLATO continued to present the lesson and hold her attention. Sara was helped past the threatening situation. PLATO managed to create a positive situation out of a potentially negative one. While this did not always occur with PLATO, from observation it appeared to be a most common case.

Sara then chose SPEEDWAY (Whole Numbers, B1) from the game slot. She read the directions aloud to herself as she worked at the terminal. Kathy, who sat next to Sara, bragged to Sara about how fast she was

working. Sara looked over at Kathy's terminal and asked Kathy which race to do on SPEEDWAY. Kathy said, "Do GRAND PRIX." Sara chose GRAND PRIX. Kathy and she discussed the game. Sara entered herself as "RACER" and named her opponent, "SLOW POKE." RACER worked hard to win. She missed 4 X 1. She got it right on the second try. When PLATO took time-out to say, "Great, you got it right this time," Sara said, "OK, OK," indicating "let's get on with the race--I don't need to be told I'm right."

NOTE: The teacher's name, the school names and all student names are pseudonyms.

The preceding scene of Sara at a PLATO terminal is an example of how data from observations are reported in this case study. The narrative above was composed using data from records of observations. The observer completed a "Child at the Terminal Check Sheet" and wrote a statement for each observation from notes taken during the observation. Sara was one of the three children chosen to follow throughout the year.

The Case Study

The objective of the study was to illuminate for the reader the culture in a fourth grade classroom surrounding the innovative computer-based PLATO mathematics program. The purpose of studying the PLATO curriculum was to understand what effects it had on the classroom environment and the children in it. In the study, achievement gains, humanism in education, attitude changes, and implementation in the classroom were investigated in relation to the use of PLATO.

The perspective taken was a cultural perspective, resulting in a descriptive account to provide educators with the opportunity to experience vicariously the culture of the classroom. The vicarious experience can be used as a source of information for making important educational decisions.

The techniques used to investigate the culture of the classroom were anthropological. A case study design was used to focus on individual children and their learning of mathematics, both by using PLATO and the more traditional method of learning from their teacher. By focusing on the individual children's perspectives, attention is drawn to the integrity of the individual child and how s/he interacts in a coordinated way. To understand how individual children benefit from the use of the terminal contributes to the understanding of using computers. In this study three children and their teacher were followed.

The data for the study were obtained through observations of the classroom using a check list and writing a narrative, observations of individual children using a child at the terminal observation form and writing a narrative, selected child interviews over time, teacher interviews over the two years, a teacher log, and discussions with the development staff. Three children and their teacher were the main informants about PLATO in the classroom.

This case study is a small part of a larger evaluation study conducted by Educational Testing Service, which was a comparison between two very large innovative computer aided instruction projects, PLATO and TICCET. The ETS evaluation of PLATO and TICCET was funded by The National Science Foundation. I worked on a part of the evaluation of PLATO elementary reading and mathematics as one of two field observers employed by ETS to observe in the elementary classrooms in Champaign-Urbana where PLATO was used to teach reading and mathematics. This study focused on one classroom and one teacher over two years time. The teacher, Ms. Sheila Hamilton, and the children are discussed in relation to PLATO terminals and learning mathematics. The findings in other classrooms were somewhat different depending upon the teacher and the children. Teachers were generally enthusiastic about the use of PLATO, but Ms. Hamilton was especially so.

PLATO

PLATO is a computer-based teaching system which provides a means for individualizing student instruction. Lessons have been designed to allow students to work at their own pace. The lesson performance is recorded and evaluated at least in part by the computer located at the Computer-based Educational Research Lab (CERL). Children sit at a terminal with a typewriter keyboard and a "touch panel." The child responds to directives and

questions on the screen by touching it or by typing a message onto the screen. PLATO responds to the child's directives and prescribes work in accordance with the child's previous performance. Children learn mathematics as they interact with the terminal to work the lessons presented on the screen.

CERL

The authors of the lessons are discussed to provide information on curriculum development. CERL at the University of Illinois is the home of PLATO and PLATO mathematics. The lab is large. Many people there work on hardware, courseware, and delivery. The advanced technology of PLATO is impressive. In the early '60s, Donald Bitzer developed the plasma display panel--the single most unique feature of PLATO--permitting replacement of the irregular patterning cathode ray tube. Bitzer was responsible for the creation of PLATO. But more than that, his genius and optimism were often forces that allowed a seemingly anarchial operation to continue to make progress. Robert Davis, a widely respected math curriculum developer, was principally in charge of the PLATO math curriculum. He put together a team of six authors to work on three strands: graphs, whole numbers, and fractions. Gerald Glynn and Don Cohen created the graph lessons. Bonnie Anderson Seiler and Charles Weaver conceptualized the whole numbers strand, and the fractions strand was designed by Sharon Dugdale and David Kibby.

From the beginning PLATO math was a multifaceted operation. In 1974 it was implemented in twelve different classrooms in the Champaign-Urbana area. The authors wrote lessons, discussed routing procedures and curriculum problems, evaluated lessons, talked to teachers, oriented teachers and observers, and wrote more lessons. Others developed additional hardware, routed lessons, talked to the authors, and maintained the system. It was

difficult even for the staff to keep up with all that was happening. There were teacher meetings, staff meetings, visits from experts in curriculum and experts of hardware. There were visitors from Japan, from Germany, from Sweden and many other countries. There were calls for help from teachers: "Touch panels aren't working," "The system is down," "The lessons are all mixed up," "The air conditioner isn't working," "Sally can't access her lessons," "The keyset won't type."

The operation was fluid. If a problem arose in the curriculum, something was changed. If authors didn't like the way a lesson was working for children, they changed it. If teachers pointed out that children needed more help, the authors went back and developed more assistance. If the patches had shown, it would have been the craziest of crazy quilts.

PLATO Authors

Pairs of authors worked on separate lessons in different areas of the curriculum. Bonnie and Charles became known as "the whole numbers people." They wrote the Whole Numbers Strand. They liked to think of the children as a resource for ideas. Lessons were based on the logical organization of mathematics and attention was given to the ways that children perceive the use of numbers.

The Graph Strand was the first to be developed for PLATO use. Don and Jerry, the graphs people, were master teachers of elementary mathematics. They aimed to program PLATO to draw out the creativity of the children. Don often stopped people in the hall to show a child's paper on which a problem was solved in a creative way or a representation of an interesting new problem that a child had created. Don felt, "Numbers are used to create, just as words are used to create." Both Don and Jerry found children's thinking a challenge.

Bob Davis set the stage for concern for teachers and children. Davis and the other authors envisioned PLATO as an instrument for in-service teacher training. Don and Jerry visited the classrooms frequently and helped children as they worked at the terminals on graph lessons. They helped Shelia Hamilton, the fourth grade teacher in this study, with her responsibilities to PLATO instruction. The first year, Sheila depended particularly upon Don and Jerry with the Graph Strand. She had little experience teaching graphs. Not only were the PLATO terminals new to her, but so were key ideas in the course materials.

Sharon and David, the fractions people, took a different approach to the lesson development in fractions. Since the concept of fractions is difficult for most teachers to teach, Sharon and David set out to make doubly sure that children could learn fractions by themselves. They programmed the lessons so as to insure success to the persistent learner. Lessons were so thoroughly programmed, step by step, that at times the children would say, "I know that, let me go on, PLATO." The authors responded by making it known to the student that he/she could SHIFT out of the lesson at any time.

The three pairs of authors presented a favorable impression. The different approaches added to the strength of the mathematics curriculum on PLATO. Because the differences in the three strands were at times reflected in the directions to the children, it created some confusion for the children, but it was, I think, outweighed by the flexibility it helped develop in children. It challenged them to think differently in different situations. Not all children can handle the same amount of ambiguity, however. I liked the sense of creativity and meeting of the unexpected of the different approaches.

Teachers' ideas and suggestions were paid attention to by the authors.

In the first year this was especially apparent, when problems of breakdown were a common occurrence, and the authors frequented the PLATO classrooms. The combination of development and implementation was a difficult one to accomplish, but the dynamics of such an operation couldn't be matched in a well organized and quiet atmosphere for writing curriculum. The authors were constantly being reminded of the real work of teachers and children, to say nothing of evaluators trailing them around observing what was going on.

The authors seemed to be in tune with children's thinking. The materials were evaluated as the children used them. The fractions people paid more attention to teachers than did the whole numbers and graphs people. There was only so much time and children were uppermost in the minds of the graphs and whole numbers developers. This is not to say that the fractions people didn't pay attention to children. They did, but more through the teachers than the other two pairs of authors.

Around the PLATO Terminals

Observations of children working at the terminals is reported to illuminate the learning environment and implementation in the classroom. There was a sharing of ideas and a sense of community around the terminals. While they were on PLATO, children associated and made friends with others who were not normally their friends. This surprised me. In other parts of the room, certain friends stuck together or boys spent little time with girls, but around the PLATO terminal, children seemed to accept anyone near them and to respond positively to requests for help or to general comments or frivolity. In one instance, children gathered around the terminals discussing games and lessons. "Shoot five point two," Debbie said to Peter, "then you'll hit the balloon." Peter was writing numbers to shoot darts at balloons tied to a

number line. Children liked to help others win games. They also helped each other with lessons. Wendy was having trouble with fractions. Lizzie, on an adjacent terminal, took a moment from DECIMAL NAMES FOR FRACTIONS (Fractions, G5) to explain to Wendy how to make one half from sixths and one fourth from eighths. Wendy was working on the lesson, PIZZA: REMEDIAL CUTTER STUCK (Fractions, 310). In this lesson the student operates a Pizza Place. The automatic pizza cutter is stuck, requiring the student to use, for example, eighths to make a half. Wendy took time out to discuss what level Sara was on. PLATO informed the children of their progress according to levels reached. Children were interested in keeping track of their progress by level and comparing it to other children's progress. Helping with lessons was generally a positive thing; however, too much help could distort the PLATO information on a particular child and advance the child's prescriptions to an impossibly difficult level. Wendy finished PIZZA and came to GAME SLOT. She went over to her friend and asked her to come to the terminal so they could play a game.

Children were sometimes frustrated by the procedures that they had to go through in order to continue on the terminal. Ann was at the terminal working on EQUIVALENT FRACTIONS GENERALIZED (Fractions, C14). When PLATO asked her to show why her answer was right, she hit the panel and said, "Oh, I know it; I don't want to show you why."

On the other hand, after a few months of using the terminals, such children quickly assessed PLATO's capacity to be wrong. At first they were overwhelmed by the great capacities of PLATO, but they got over it. They learned to use it as a machine and not as a powerful unknown.

Children evaluated lessons and suggested improvements. Jon said in the student comments on PLATO, "PINBALL IS FUN BUT YOU SHOULD BE ABLE TO WIN FREE GAMES. ALL THE NEW GAMES AREN'T CHALLENGING. NO REAL FUN. HOCKEY

(Whole Numbers, I1) IS FUN BECAUSE IF YOU'RE GOOD, YOU CAN STILL LOSE. GET IT?" He called PLATO "CHEAP" because his lesson was terminated after 26 minutes. The children liked to get 30 minutes at least.*

Children became disgusted when the keys wouldn't work. Peter said, "This number 5 key is all messed up." They also recognized PLATO's mistakes. Kathy said, "You dummy PLATO, I multiplied the problem right." She had. Errors of this sort were usually caused by noise on the telephone line that connected the terminal to the central computer. When playing BATTLESHIP (Graphs, 1b), children often told PLATO, "You cheat, you really know where my battleship is." And of course PLATO did know. But when PLATO was working, he/she played by the rules. For some children, PLATO was a space away from others. Bob said, "Well, I just use it (PLATO) sorta like a slot for myself--gettin' away from all those other people in the classroom."

Children were not forced to use PLATO. It was a privilege. Anyone who abused the privilege could be restricted for a day. For instance, one day Tom wrote a note on PLATO: "WHY DON'T GET A GAME SLOTE YOU MAD SOUK A EAG KISS IT TO PIG YOU FAT COW 9 = 90." The teacher responded on the terminal: "I THINK YOU CAN WRITE A MORE INTELLIGENT, POLITE NOTE THAN THIS. IF NOT, PERHAPS YOU WOULD RATHER NOT USE PLATO FOR A WHILE ... MS. HAMILTON."

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*PLATO was programmed not to interrupt a child in the middle of a task. For each task, PLATO computed the average time required by many children; then, for each individual child, PLATO computed his/her personal "speed factor"--perhaps a child tended to take 15% longer than the average child, say, or perhaps he/she would complete tasks in 70% of the usual time. From these two numbers, PLATO could estimate how long this particular child would be likely to take on a particular task. If he/she would just be getting started before his/her session was up, PLATO would wait and start that task at the next day's session. In this way, sessions were made to average about 30 minutes each without interrupting a student in the middle of a task.

This response by the teacher was not inconsistent with her actions in regard to other materials in the room. Sheila recognized the tremendous power of PLATO to motivate and took advantage of the situation to encourage children to become more responsible for their actions. She calmly discouraged immature and self-pitying behavior--also discouraged being too emotional about such incidents.

The children showed responsibility in the classroom. Children talked about finishing lessons before going on to games. They took the responsibility for completing lessons and worked hard to do so. In the story of Ted, he finished many levels of fractions before he would give up and go on to games, even though he loved games and was aware that his time might be up before he got a game for the day. Kate, who at first, couldn't remember to tell another child it was his turn on PLATO, later took the responsibility to see that the terminals were always in use. Most children didn't need to be reminded to work on PLATO.

Having only four terminals in the room created problems. Children had to be organized and scheduled in order to get everyone on the terminals for the day. It also contributed in very positive ways. Children learned to share and be flexible. Ms. Hamilton made sure that everyone had a turn, but the children had to be ready or trade turns if that made it easier to schedule reading or music lessons. No one's time on PLATO was fixed. Having only four terminals also made the time on them precious. Since Ms. Hamilton could not be with the children at the terminal and carry on other activities too, the children were allowed to help each other with problems on PLATO. Children exchanged ideas and helped each other as they worked at the terminal. This created a very social learning dialogue between the children.

The degree of competitiveness that PLATO generated seemed to be partly

a function of the general atmosphere and structure in the classroom. Smith and Pohland (1975)* also found varying degrees of competition in particular classrooms and buildings when Computer-Aided Instruction was implemented in the Rural Highlands.

In Ms. Hamilton's room, competition was a part of the everyday life in the classroom. There were contests with prizes for citizenship as well as for mastery of facts in arithmetic. The competition seemed to focus more on measuring an individual's previous accomplishments with more recent ones, rather than on comparison with others.

The children were accustomed to competition, and PLATO gave those children who wanted to compare and compete, opportunity to do so. Children would brag about how far they were in certain lessons, how many games they had won, how fast they could type, who had done the most lessons, who had the most time or sessions on the terminal, who had won the most games, etc. I didn't sense a feeling of unhappiness because of the competition. No one wanted to stop using PLATO because they were being outdone. They did ask to do games and lessons that they saw on the screen when others were working. In other rooms there were some instances of hogging the terminals and not sharing that was not very evident in Ms. Hamilton's room.

The teacher's log was a rich source of information. The data obtained from the observations of teachers and children were verified by teacher interviews and teacher logs. The many sources provided data for triangulation and portrayed a part of the complexities of the classroom. In the excerpt from the teacher log that follows, the teacher reveals her philosophy and method

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*Louis M. Smith and Paul A. Pohland, "Education, Technology and The Rural Highlands," AERA Monograph No. 7, 1974.

for working with children who were disruptive. In this example, several unruly youngsters were intrigued with PLATO. It served from there on (in part, of course) as a reward for good behavior in the classroom.

Teacher's Log:

Two children made great impressions the first day of terminal use.

Larry had been a problem since he put his foot through the door. He was obviously in need of a great deal of attention--not from classmates--from the teacher. Anytime he did not receive "instant attention" he laid on the floor, making loud noises, kicking his legs. This was not a new behavior for him. I learned that he enjoyed verbal battles with previous teachers. He was referred to the social worker and I tried to give him positive interaction as soon as he entered the room and frequently throughout the day. He is very resistant bo any form of testing and becomes quite upset when he doesn't understand something or feels he cannot perform a particular task. If he doesn't receive immediate help, he starts making noises loud enough to disturb others trying to concentrate. After a week, I discovered that the most effective method of working with Larry was to try to avert problems by testing him on a 1 to 1 basis as soon as an assignment had been given so that I could be sure he understood and felt confident. If he became upset, it seemed to be most effective to ignore his negative behavior. This was, at times, very difficult. After a cooling off period, it was often possible to get him back on the track with coaxing. Sometimes the behavior could not be ignored and he was told to leave the room until he could control himself.

Larry had had some experience with PLATO. He was at once at home with the terminal. This was to date the only task that he tackled "on his own"--the first non-one to one achievement. From the first day he was staying after school for an extra turn. This became an important factor in control. He could stay for an extra turn only when he had been cooperative during the day. This motivated him and slowly he began to correct his behavior. He often stays an hour after school.

Barry had no previous experience on PLATO. Although his behavior was not as unusual as Larry's he had also been referred to the social worker. He and his brothers (2 younger) had been living with his divorced father, visiting their mother on a weekly basis. The father remarried shortly after school started. Barry was so upset that he

didn't come to school for several days. His study habits are extremely immature. He accomplishes nothing and seems to remember very little of practiced skills. He missed almost all addition and subtraction facts and doesn't remember borrowing in subtraction. I teach him renaming every day. The next day--or even the same afternoon--he has forgotten and we must go through all of it again. His attention span was two or three minutes, even on a 1 to 1 basis. He is frequently in trouble on the playground and in the hall. I have had to be very strict with him as he quickly takes advantage to act silly, poke at classmates, or play. He has learned to behave in my presence, but cannot be trusted to do any work or keep his hands to himself if I must leave the room or turn my back too long. His papers (when he puts anything on them) are very poorly written. He seemed to have little success in any academic area.

I watched Barry as he first signed in and started to work on the terminal. I couldn't believe this was the same boy. He was at last catching on quickly and performing well. This was his first success in over a month of school. PLATO is the one thing he is ready and anxious to do. He watches for his turn and is happiest when he is using the terminal--gladly gives up recess for his turn.

* *

PLATO seemed to provide a special private space for some children. They could be engaged in learning new skills in a non-threatening atmosphere and at the same time be rewarded by instant feedback. Children somehow felt accepted and satisfied to the extent that they did not need or want to protest. Instead they enjoyed the challenge of the lessons. Sheila Hamilton was grateful to have found a way to reach children who seemed to find most of their school day an unrewarding experience.

Student Comments on PLATO - Electronic Graphiti

The children's notes on PLATO were a rich source of information on children's attitudes and difficulties at the terminals. Children took PLATO's invitation to express, HOW I FEEL TODAY.

The terminal served as a communication system, a friend to listen to the child's worries, frustrations, and joys. Children used the terminal to say they were angry, to say they had fun, to request more games, to make suggestions to PLATO, to ask for help. In general they carried on conversations and communicated as if with a person who was interested in them. They loved PLATO, they hated PLATO, they thought PLATO was clever and dumb, but they never stopped wanting to be on PLATO.

Teachers and CERL people used the terminal to respond to children's thoughts. The adults found the notes helpful in the continuing development of lessons.

Children Liked PLATO, Thought it Was Fun

. . . . KITTY N . . . .

DEAR PLATO, I THOUGHT MR. MATH WAS A NEAT IDEA. WHO GETS
ALL THE IDEAS FOR PLATO / BYE-BYE FOR NOW.
YOURS,
KITTY N

. . . . LIZZIE L . . . .

LESSON PICO-FOMI
MODULE MULT. TECHNIQUES AND SUBTRACTION-1

PLATO THAT LESSON WAS NOT TOO HARD AND NOT TOO EASY FOR ME
I REALLY LIKE THAT.

. . . . DEBBIE D . . . .

DEAR PLATO, I LIKE THE GAMES YOU PLAY.
BUT NOW I HAVE TO GO.

. . . . KITTY N . . . .

DEAR PLATO, THIS WAS A VERY NICE SESSION. NOT TO HARD
OR TO EASY. I AM GLAD SOME-ONE WAS ABLE TO INVENT YOU.

. . . . SALLY R . . . .

I HAD A FUN TIME ON PLATO TODAY. I LIKED IT VERY MUCH.

DEAR PLATO I THINK MY TEARN IS FUN THANK FOR PLATO I LIKE
IT IT IS FUN.

. . . . BILLY B . . . .

LESSON HOW THE WEST WAS ONE
MODULE MULT. TECHNIQUES AND SUBTRACTION-1

7 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6
I T W A S F U N . B U
T E A S Y
6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6

Children Disliked PLATO, Thought PLATO WAS DUMB

. . . . SHELLY S . . . .

DEAR PLATO
WOULD YOU PLEASE NOT GIVE ME DARTS I DO NOT LIKE IT
IT IS DUMB.
YOURS SHELLY S

DEAR PLATO WOULD YOU NOT GIVE ME MISSION INPOSSAL
IT,S IS DUMB
SHELLY S

. . . . PETER S . . . .

LESSON EQUIVALENT FRACTIONS GENERALIZED
MODULE EQUIVALENT FRACTIONS

THIS LISEN
IS DUM I DON,T SEE Y . THAT IS WON OF THE COMENTS IN,Y WAY
IT GET,S ME SICK IA

. . . . JON C . . . .

HORES RACS IS A DOG AND THE PEPOLF WHO MADE IT IS TO.

. . . . BEN D . . . .

I WANT A BIG GAME SLOT . . . . . .
. . . . . .
FROM BEN D

. . . . LIZZIE LEE . . . .

PLATO. I WOULD LIKE YOU TO KEEP OBSTACLE COURSE IN GAME SLOT. I DID NOT GET TO TRY IT TODAY, BUT IT LOOKS LIKE FUN.
YOURS TRULY
LIZZIE LEE

DEAR PLATO, THANK YOU, FOR KEEPING OBSTICLE COURSE IN GAME SLOT (I AM SORRY ABOUT NOT THANKING YOU SOONER) BUT I THINK THE GAME IS TO FAST FOR ME. I DO NOT LIKE IT ANY MORE. LIZZIE LEE

Children Made Suggestions - Questioned the Lessons - Pointed out Errors

. . . . KITTY N . . . .

DEAR PLATO, WHAT WAS THE ERROR IN THE LESSON I JUST FINISHED / IS MY TIME UP / GOOD-BYE, BYE-BYE. SE YOU

DEAR PLATO, THE REASON I DID NOT WIN HOCKEY WAS BECAUSE I FORGOT THE NUMBERS FOR THE ANGLES. I THINK YOU SHOULD KEEP THE NUMBERS FOR THE ANGLES IN SIGHT.

DEAR PLATO, WHY IS IT SOME TIMES YOU GIVE ME VERY SHORT LESSONS /LIKE JUST NOW YOU GAVE ME A LESSON THAT LASTED ABOUT 2 MINUTES. KITTY N

DEAR PLATO, IN HOP GAME, PLATO ALWAS GETS TO BE THE BUNNY. I WOULD LIKE TO BE THE BUNNY.
SO-LONG,
KITTY N

. . . . BEN D . . . .

LESSON TORPEDO
MODULE MIXED NUMBERS AND FRACTIONS > 1

DEAR PLATO,
WHY DOES PLATO GET
MESSED UP A LOT /
FROM COOL CAT.

. . . . BILLY B . . . .

LESSON EQUIVALENT FRACTIONS GENERALIZED
MODULE EQUIVALENT FRACTIONS

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Conclusions

Results from the use of PLATO show that the children and the teacher benefitted from the PLATO math curriculum. After two years with PLATO terminals in her room, Ms. Hamilton continued to extoll the virtues, "I think PLATO is great. I hope to remain in the program. . . . I wish more children could have use of the terminals." The students never missed a turn. Sara said, "I want to go into Mr. Kalisch next year 'cause he has PLATO." Ted said, "PLATO is better than regular math. I like PLATO 'cause you get to play a lot of games. Kate said, "I likes games on PLATO because you can get a friend to play with you." Other children said the same. Their actions on the terminal verified their statements. Children were engaged while working on PLATO. It usually was 30 minutes of study time. The time on task was sometimes spent giving help to another child (doing a simpler lesson) or writing notes to the authors. As Ms. Hamilton said, "The children not only learned math but reading, spelling, and writing as well." Every child learned on PLATO, even those who didn't like math. The California Test of Basic Skills test scores show the children gained, on the average, over two years in one per child. Children learned to be responsible for their own work. Ted said, "I'm on level 10 of 12." He continued in the lesson to level 11 and said, "Now if I can get here, I probably can pass." He finished 12 of 12 and said, "Oh boy, I finished EQUIVALENT FRACTIONS

GENERALIZED." Ted was a child who didn't work on any teacher assignments at the beginning of the year. He stamped his feet and yelled when pressed to finish an assignment. Ms. Hamilton said, "Children learned to concentrate, they became proud of the successes they had. I feel they learned to try not so much in relation to others, but in relation to their own progress."

But the most important PLATO achievement of all is not in fractions, division, nor in attention to directions, nor in typing, nor in gamesmanship, nor in socialization, but in enthusiasm for learning mathematics. Sara did not want to do her sixes, but at the end of the year she was ready and eager for percentage. Kate was still getting nowhere with fractions, but she knew that PLATO could help her learn. And Ted was finishing assignments in math, and in social studies as well.

PLATO can teach, and children do learn. The children were happy. The parents and grandparents were happy. PLATO was clearly a success in Ms. Hamilton's fourth grade room.

The study is important to the understanding of students' experience in the total culture of the PLATO classroom. The study illuminates for the reader the cognitive learning, degree of social interaction, and unexpected outcomes when students use PLATO terminals to learn mathematics.